TFT LCD Approval Specification

MODEL NO.: M190Z3-L06

Customer: _____

Approved by: _____

Note:

核准時間	部門	審核	角色	投票
2009-05-08 09:19:38	MTR 產品管理處	吳 2009.05.08 柏 勳	Director	Accept

- CONTENTS -

	Date	Section	Description
1.0	Feb. 04, '09	All	M190Z3-L06 Specifications was first issued.
2.0	May. 05, '09	1.5	Modify maximum depth and weight of the module.
		3.3	Modify the lifetime of LED light bar.
		6.2	Add note(7) description of preventing slight electric noise when turning off.
		7.2	Add viewing angle specification when CR ≧ 5.

1. GENERAL DESCRIPTION

1.1 OVERVIEW

M190Z3-L06 is a 19" wide TFT Liquid Crystal Display module with white LED Backlight unit and 30 pins 2ch-LVDS interface. This module supports 1680 x 1050 WSXGA+ mode and can display 16.7M colors. The converter module for Backlight is not built in.

1.2 FEATURES

- Super Wide viewing angle.
- Super High contrast ratio
- Super fast response time
- High color saturation
- WSXGA+ (1680 x 1050 pixels) resolution
- DE (Data Enable) only mode
- LVDS (Low Voltage Differential Signaling) interface
- RoHS Compliance

1.3 APPLICATION

- TFT LCD Monitor

1.4 GENERAL SPECIFICATI0NS

Item	Specification	Unit	Note
Diagonal Size	481.4 (18.95" diagonal)	mm	
Active Area	408.24 (H) x 255.15 (V)	mm	(1)
Bezel Opening Area	412.24 (H) x 259.15 (V)	mm	
Driver Element	a-si TFT active matrix	-	-
Pixel Number	1680 x R.G.B. x 1050	pixel	-
Pixel Pitch	0.243 (H) x 0.243 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	16.7M	color	-
Transmissive Mode	Normally White	-	-
Color saturation	68%NTSC (typ.)	-	-
Surface Treatment	Hard coating (3H), Anti-glare (Haze 25)	-	-
Module Power Consumption	12.55	Watt	(2)

1.5 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)	427.5	428	428.5	mm	(1)
	Vertical(V)	277.5	278	278.5	mm	
	Depth(D)	12.81	12.84	12.87	mm	
Weight		-	1415	1450	g	-

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

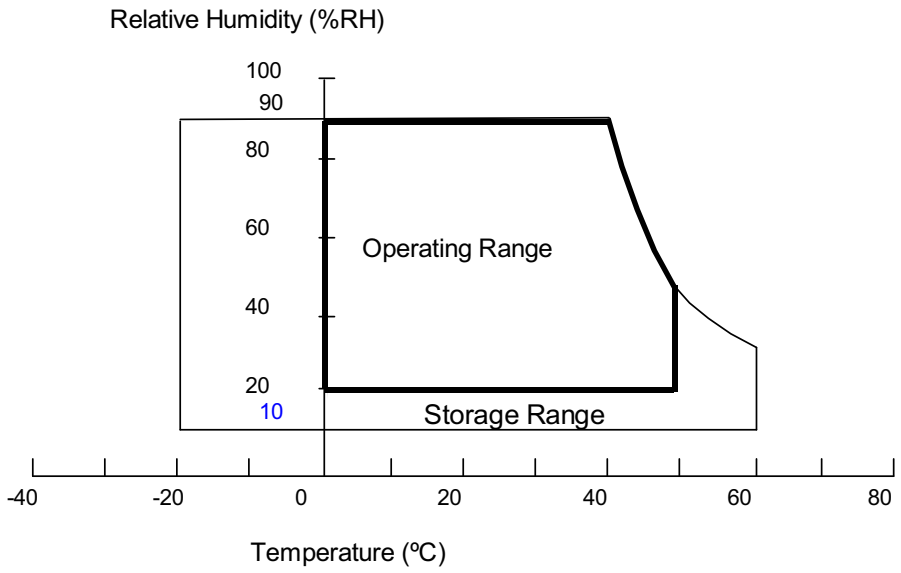
Note (2) Please refer to sec.3.1 & 3.2 for more information of power consumption

2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1)
Operating Ambient Temperature	T_{OP}	0	+50	ºC	(1), (2)
Shock (Non-Operating)	S_{NOP}	-	50	G	(3), (5)
Vibration (Non-Operating)	V_{NOP}	-	1.5	G	(4), (5)

Note (1) Temperature and relative humidity range is shown in the figure below.



(a) 90 %RH Max. (Ta ≦ 40 ºC).

(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

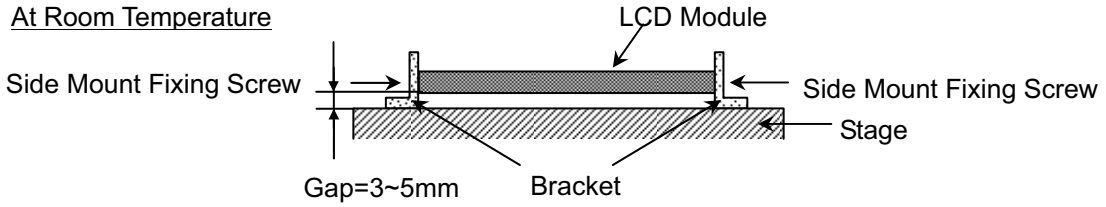
(c) No condensation.

Note (2) The temperature of panel display surface area should be 0 ºC Min. and 60 ºC Max.

Note (3) 50G,11ms, half sine wave, 1 time for ± X, ± Y, ± Z.

Note (4) 10 ~ 300 Hz, sweep rate 10 min / cycle , 30 min for X,Y,Z axis.

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.



2.2 ELECTRICAL ABSOLUTE RATINGS

2.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	Vcc	-0.3	+6.0	V	(1)

2.2.2 BACK LIGHT UNIT

Item	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED DC forward current	I_f	---	60	65	mA	(1)
LED Peak pulse current	Ip	---	---	100		
LED Reverse voltage	Vr	---	---	5.0	V	

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

3. ELECTRICAL CHARACTERISTICS

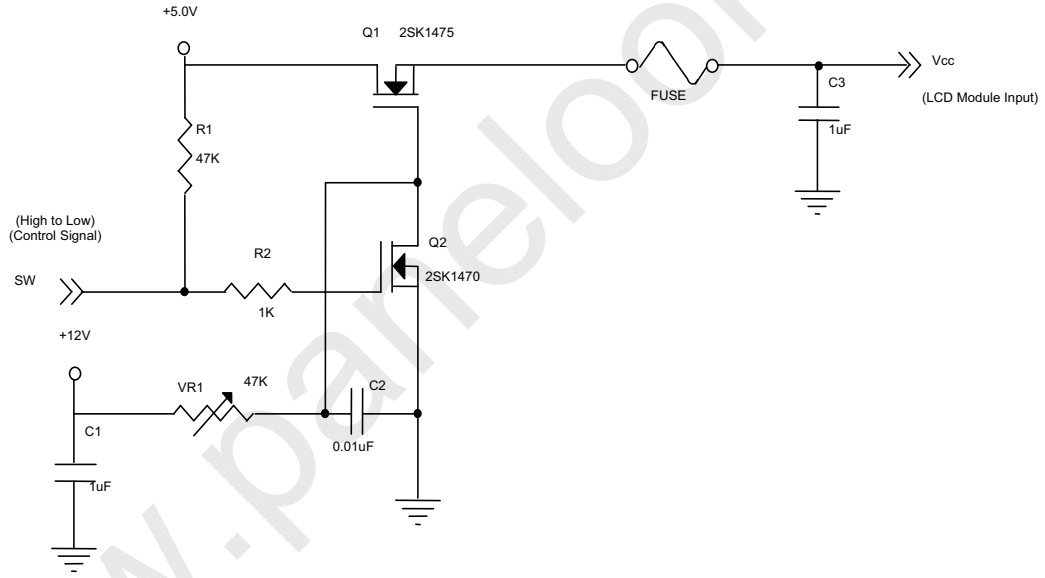
3.1 TFT LCD MODULE

Ta = 25 ± 2 ºC

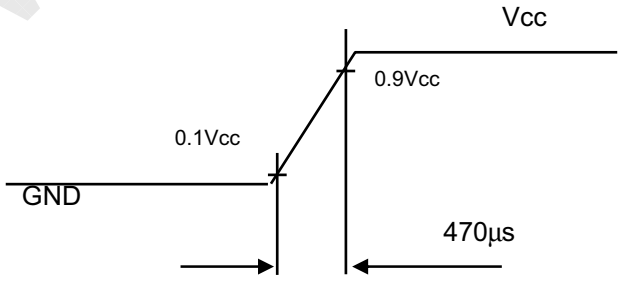
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		Vcc	4.5	5.0	5.5	V	-
Ripple Voltage		V_{RP}	-	-	100	mV	-
Rush Current		I_{RUSH}	-	-	3	A	(2)
Power Supply Current	White	Icc	-	0.52	0.728	A	(3)a
	Black		-	0.77	1.078	A	(3)b
	Vertical Stripe		-	0.77	1.078	A	(3)c
Power Consumption		P_{LCD}	-	3.85	5.39	watt	(4)
LVDS differential input voltage		Vid	100	-	600	mV	
LVDS common input voltage		Vic	-	1.2	-	V	

Note (1) The module should be always operated within above ranges.

Note (2) Measurement Conditions:



Vcc rising time is 470µs



Note (3) The specified power supply current is under the conditions at Vcc = 5.0 V, Ta = 25 ± 2 ºC, f_v = 60 Hz, whereas a power dissipation check pattern below is displayed.

Note (4) The power consumption is specified at the pattern with the maximum current.

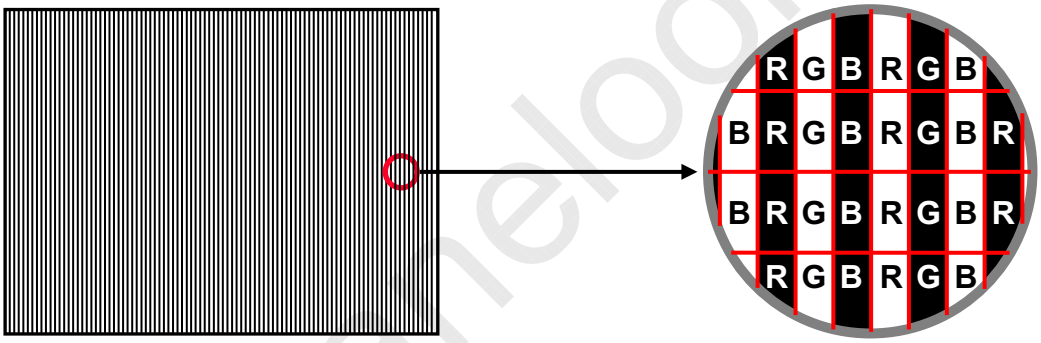
a. White Pattern

Active Area

b. Black Pattern

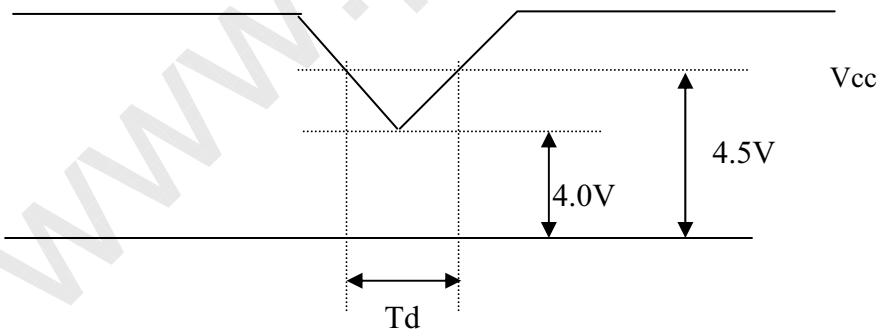
Active Area

c. Vertical Stripe Pattern



Active Area

3.2 Vcc Power Dip Condition:



Dip condition: $4.0V \leq Vcc \leq 4.5V, Td \leq 20ms$

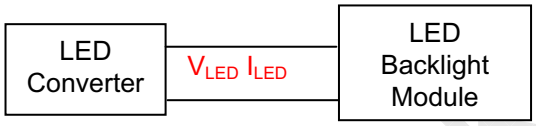
3.3 BACKLIGHT UNIT

Ta = 25 ± 2 ºC

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Light Bar Input Voltage	V_{LED}	31.9	36.3	41.8	V_{DC}	(Duty 100%)
Light Bar Input Current	I_{LED}	58.2	60	61.8	mA_{DC}	(Duty 100%) per string
Power Consumption	P_{LED}	---	8.71	---	W	(1)
LED Life Time	L_{BL}	20000	---	---	Hrs	(2)

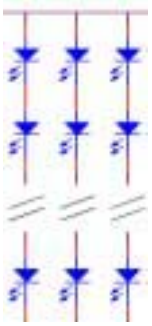
Note (1) $P_{LED} = (I_{LED} \times 4) \times V_{LED}$, LED matrix is 11S4P.

Note (2) The lifetime of LED is defined as the time when it continues to operate under the conditions at Ta = 25 ± 2 oC and I = 60 mA(Per EA) until the brightness becomes ≦ 50% of its original value.



3.4 LIGHTBAR Connector Pin Assignment

Connector: 91500-00801-H 宏致(Aces)



CN1

Pin1,2: VLED

Pin3,4: OPEN

Pin5,6: Channel 2 (11 LEDs Series)

Pin7,8: Channel 1 (11 LEDs Series)

CN2

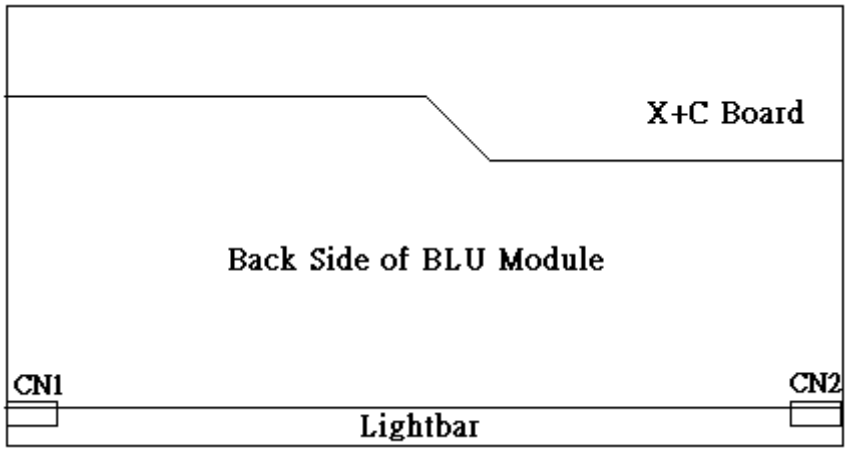
Pin1,2 : Channel 4 (11 LEDs Series)

Pin3,4: Channel 3 (11 LEDs Series)

Pin5,6: OPEN

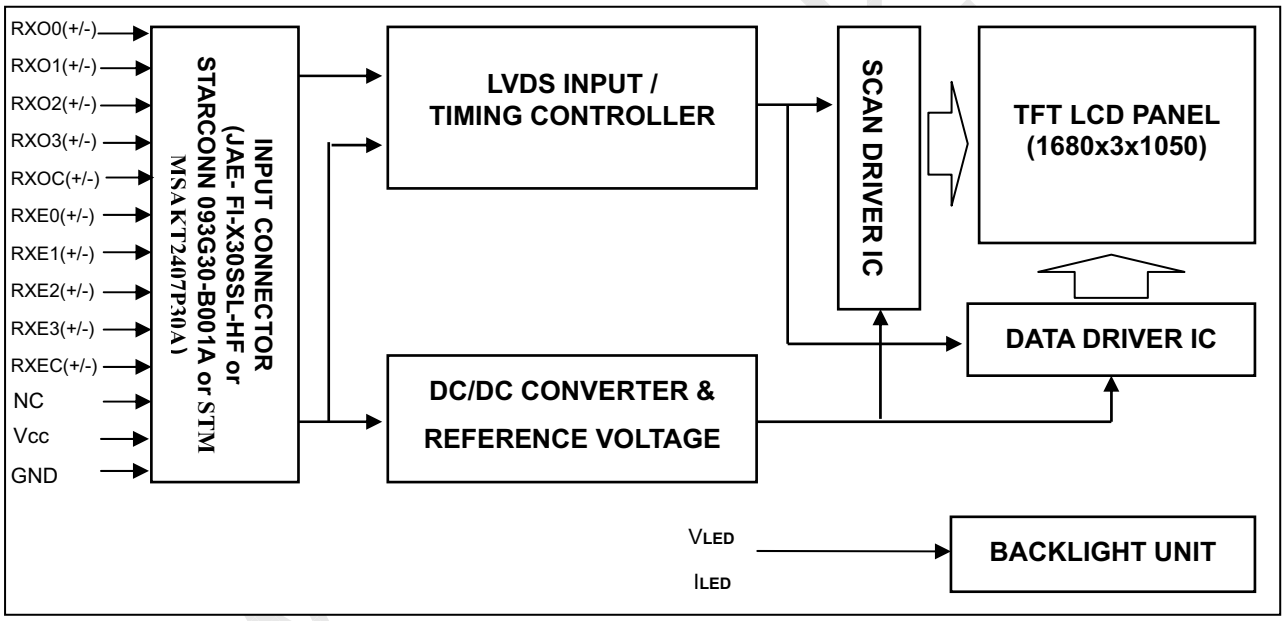
Pin7,8: VLED

60mA for each channel



4. BLOCK DIAGRAM

4.1 TFT LCD MODULE



5. INPUT TERMINAL PIN ASSIGNMENT

5.1 TFT LCD MODULE

Pin	Name	Description
1	RXO0-	Negative LVDS differential data input. Channel O0 (odd)
2	RXO0+	Positive LVDS differential data input. Channel O0 (odd)
3	RXO1-	Negative LVDS differential data input. Channel O1 (odd)
4	RXO1+	Positive LVDS differential data input. Channel O1 (odd)
5	RXO2-	Negative LVDS differential data input. Channel O2 (odd)
6	RXO2+	Positive LVDS differential data input. Channel O2 (odd)
7	GND	Ground
8	RXOC-	Negative LVDS differential clock input. (odd)
9	RXOC+	Positive LVDS differential clock input. (odd)
10	RXO3-	Negative LVDS differential data input. Channel O3(odd)
11	RXO3+	Positive LVDS differential data input. Channel O3 (odd)
12	RXE0-	Negative LVDS differential data input. Channel E0 (even)
13	RXE0+	Positive LVDS differential data input. Channel E0 (even)
14	GND	Ground
15	RXE1-	Negative LVDS differential data input. Channel E1 (even)
16	RXE1+	Positive LVDS differential data input. Channel E1 (even)
17	GND	Ground
18	RXE2-	Negative LVDS differential data input. Channel E2 (even)
19	RXE2+	Positive LVDS differential data input. Channel E2 (even)
20	RXEC-	Negative LVDS differential clock input. (even)
21	RXEC+	Positive LVDS differential clock input. (even)
22	RXE3-	Negative LVDS differential data input. Channel E3 (even)
23	RXE3+	Positive LVDS differential data input. Channel E3 (even)
24	GND	Ground
25	NC	Not connection, this pin should be open.
26	NC	Not connection, this pin should be open.
27	NC	Not connection, this pin should be open.
28	Vcc	+5.0V power supply
29	Vcc	+5.0V power supply
30	Vcc	+5.0V power supply

Note (1) Connector Part No.: 093G30-B001A (STARCONN) or FI-X30SSL-HF (JAE) or MSAKT2407P30A(STM) or equivalent.

Note (2) The first pixel is odd.

Note (3) Input signal of even and odd clock should be the same timing.

5.2 LVDS DATA MAPPING TABLE

LVDS Channel O0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	OG0	OR5	OR4	OR3	OR2	OR1	OR0
LVDS Channel O1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	OB1	OB0	OG5	OG4	OG3	OG2	OG1
LVDS Channel O2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	OB5	OB4	OB3	OB2
LVDS Channel O3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	OB7	OB6	OG7	OG6	OR7	OR6
LVDS Channel E0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	EG0	ER5	ER4	ER3	ER2	ER1	ER0
LVDS Channel E1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	EB1	EB0	EG5	EG4	EG3	EG2	EG1
LVDS Channel E2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	EB5	EB4	EB3	EB2
LVDS Channel E3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	EB7	EB6	EG7	EG6	ER7	ER6

5.3 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																							
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	R7	R6	G5	G4	G3	G2	G1	G0	R7	R6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
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	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
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	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
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	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage

6. INTERFACE TIMING

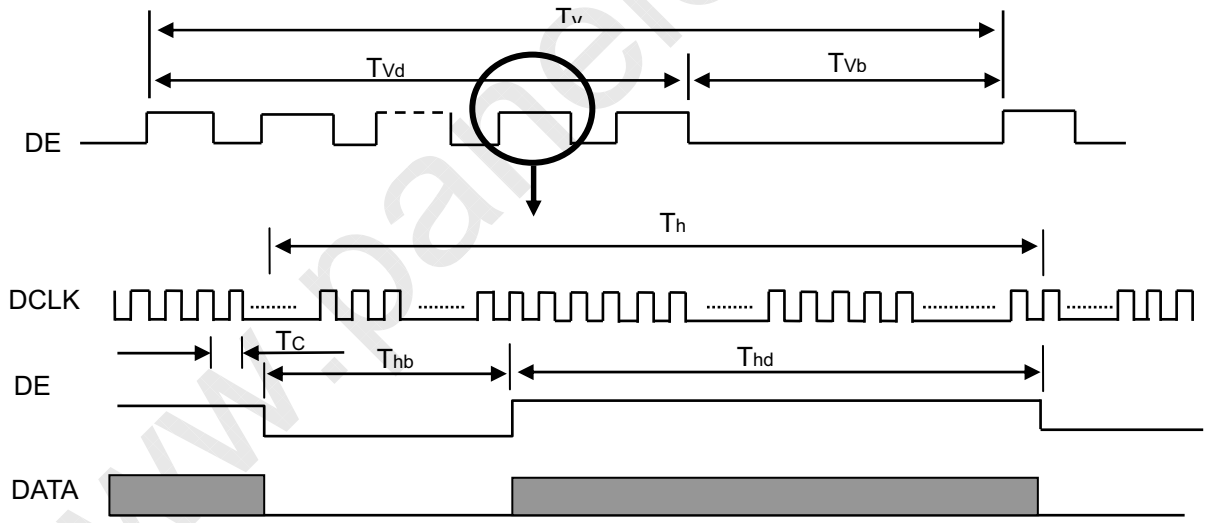
6.1 INPUT SIGNAL TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Clock	Frequency	Fc	49	60	76	MHz	-
	Period	Tc	13	16.7	20	ns	
	High Time	Tch	-	4/7	-	Tc	-
	Low Time	Tcl	-	3/7	-	Tc	-
LVDS Data	Setup Time	Tlvs	600	-	-	ps	-
	Hold Time	Tlvh	600	-	-	ps	-
Vertical Active Display Term	Frame Rate	Fr	-	60	75	Hz	Tv=Tvd+Tvb
	Total	Tv	1066	1080	1137	Th	-
	Display	Tvd	1050	1050	1050	Th	-
	Blank	Tvb	Tv-Tvd	30	Tv-Tvd	Th	-
Horizontal Active Display Term	Total	Th	910	920	970	Tc	Th=Thd+Thb
	Display	Thd	840	840	840	Tc	-
	Blank	Thb	Th-Thd	80	Th-Thd	Tc	-

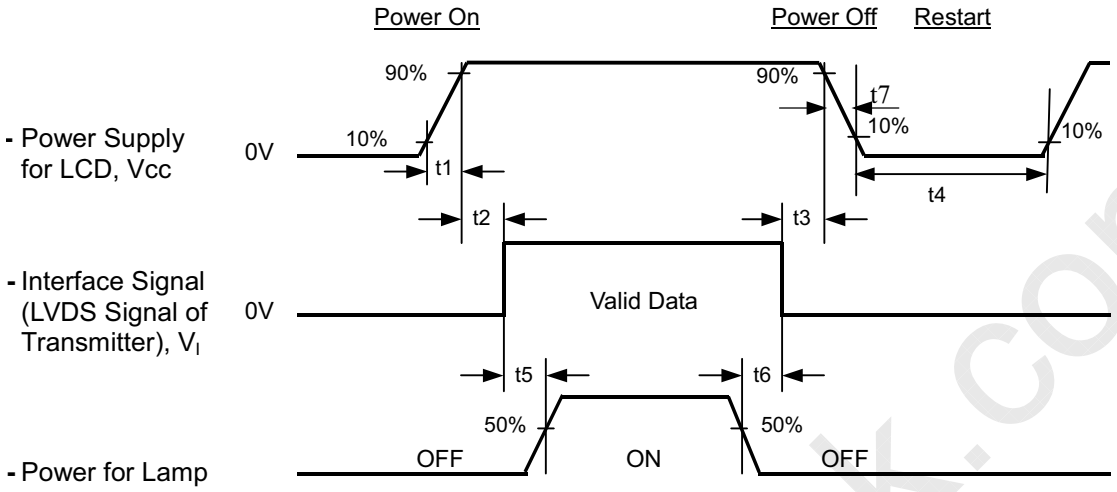
Note: Because this module is operated by DE only mode, Hsync and Vsync input signals should be set to low logic level or ground. Otherwise, this module would operate abnormally.

INPUT SIGNAL TIMING DIAGRAM



6.2 POWER ON/OFF SEQUENCE

To prevent a latch-up or DC operation of LCD module, the power on/off sequence should be as the diagram below.



Timing Specifications:

0.5< t1 ≦ 10 msec

0 < t2 ≦ 50 msec

0 < t3 ≦ 50 msec

t4 ≧ 500 msec

t5 ≧ 450 msec

t6 ≧ 90 msec

5 ≦t7 ≦ 100 msec

Note.

(1) The supply voltage of the external system for the module input should be the same as the definition of Vcc.

(2) Apply the light bar voltage within the LCD operation range. When the backlight turns on before the LCD operation of the LCD turns off before the backlight turns off, the display may momentarily become abnormal screen.

(3) In case of Vcc = off level, please keep the level of input signals on the low or keep a high impedance.

(4) t4 should be measured after the module has been fully discharged between power of and on period.

(5) Interface signal shall not be kept at high impedance when the power is on.

(6) CMO won't take any responsibility for the products which are damaged by the customers not following the Power Sequence.

(7) There might be slight electronic noise when LCD is turned off (even backlight unit is also off). To avoid this symptom, we suggest "Vcc falling timing" to follow "t7 spec".

7. OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

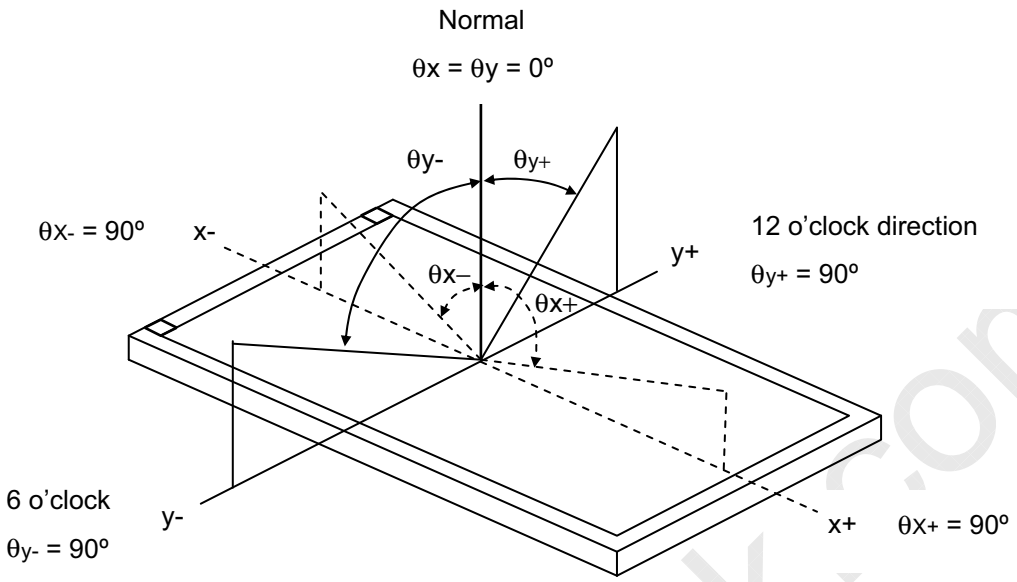
Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	5.0	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Light Bar Input Voltage	V_{LED}	36.3	V_{DC}
Light Bar Input Current	I_{LED}	60±1.8	mA_{DC} (per string)
Duty	D	100	%

7.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 7.2. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (5).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color Chromaticity	Red	Rx	θ_x=0°, θ_Y =0° CS-1000T	-0.05	0.634	+0.05		(1), (5)
		Ry			0.346			
	Green	Gx			0.329			
		Gy			0.614			
	Blue	Bx			0.158			
		By			0.060			
	White	Wx			0.313			
		Wy			0.329			
Center Luminance of White		L_C		200	250	---	cd/m^2	(4), (5)
Contrast Ratio		CR		700	1000	---	-	(2), (5)
Response Time		T_R	θ_x=0°, θ_Y =0°	---	1.5	2.5	ms	(3)
		T_F		---	3.5	5.5	ms	
White Variation		δW	θ_x=0°, θ_Y =0°	---	1.25	1.33	-	(5), (6)
Viewing Angle	Horizontal	θ_x+	CR ≧ 10	75	85	---	Deg.	(1), (5)
		θ_x-		75	85	---		
	Vertical	θ_Y+		70	80	---		
		θ_Y-		70	80	---		
Viewing Angle	Horizontal	θ_x+	CR ≧ 5	80	89	---	Deg.	(1), (5)
		θ_x-		80	89	---		
	Vertical	θ_Y+		75	85	---		
		θ_Y-		75	85	---		

Note (1) Definition of Viewing Angle (θx, θy):



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L255 / L0

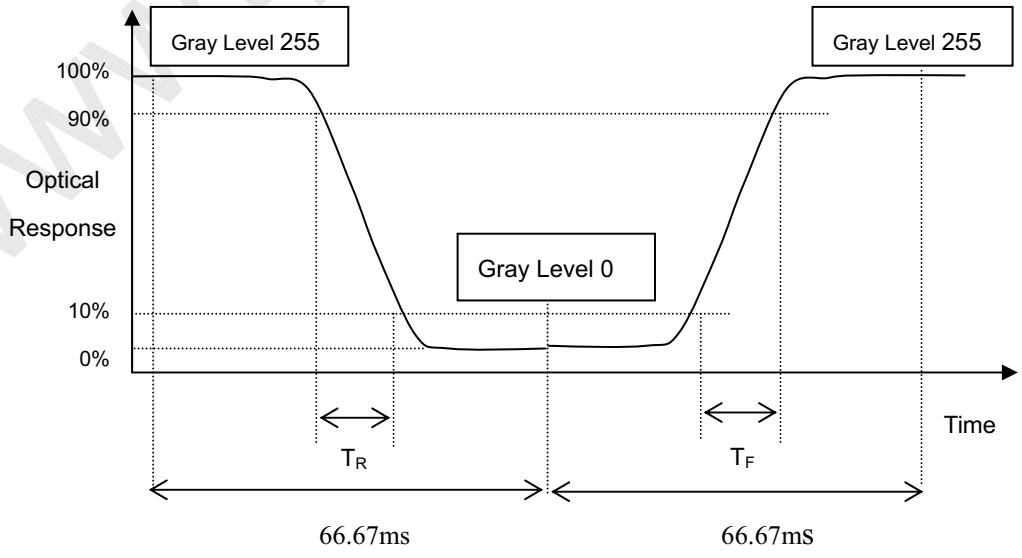
L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (5)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

Note (3) Definition of Response Time (T_R, T_F):



Note (4) Definition of Luminance of White (L_C):

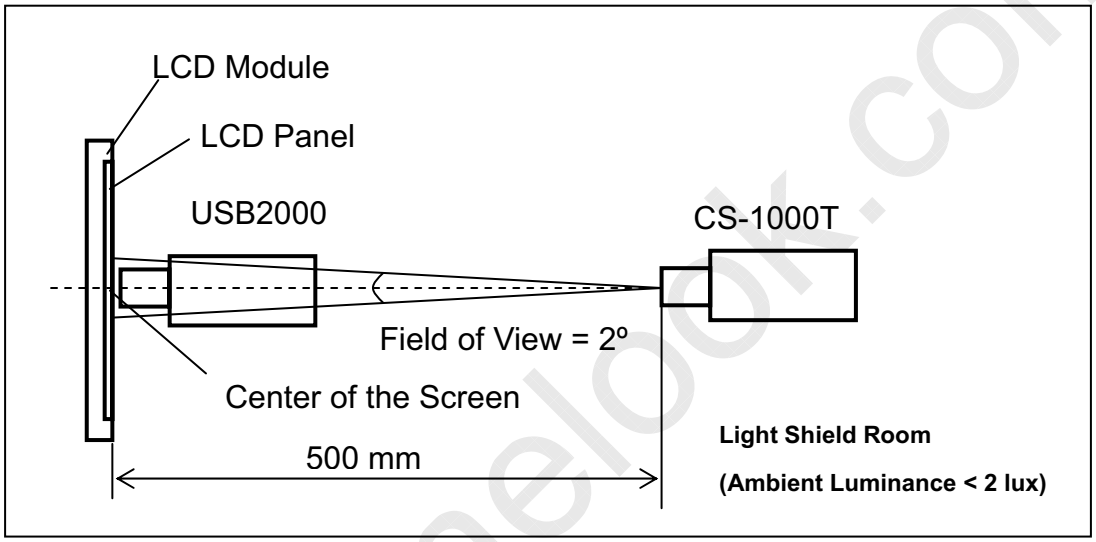
Measure the luminance of gray level 255 at center point

L_C = L (5)

L (x) is corresponding to the luminance of the point X at Figure in Note (6).

Note (5) Measurement Setup:

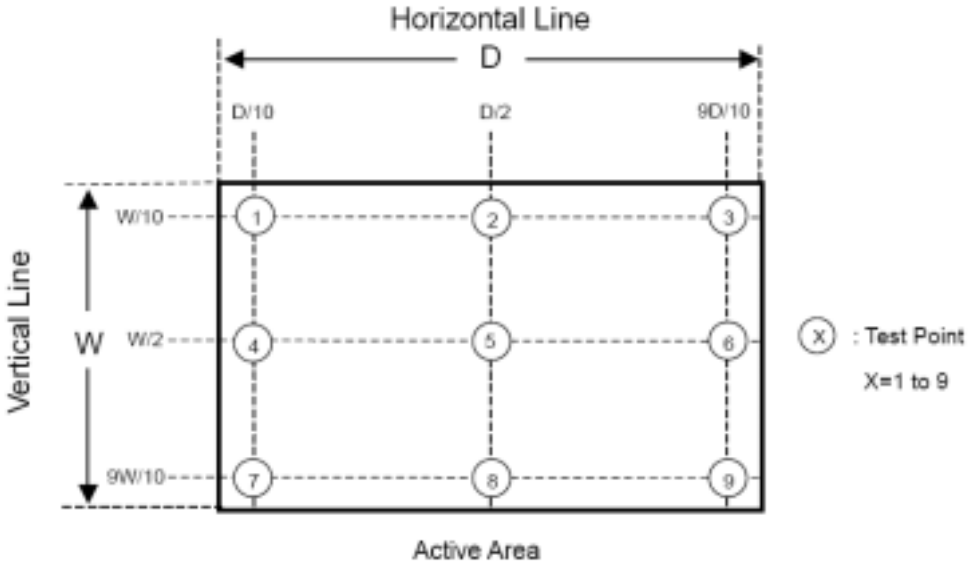
The LCD module should be stabilized at given temperature for 40 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 40 minutes in a windless room.



Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 9 points

δW = Maximum [L (1), L (2) ……L (4), L (9)] / Minimum [L (1), L (2) …… L (4), L (9)]



8. PACKAGING

8.1 PACKING SPECIFICATIONS

(1) 7 LCD modules / 1 Box

(2) Box dimensions: 525(L) X 300 (W) X 360 (H) mm

(3) Weight: approximately 12.0 Kg (7 modules per box)

8.2 PACKING METHOD

(1) Carton Packing should have no failure in the following reliability test items.

Test Item	Test Conditions	Note
Vibration	ISTA STANDARD Random, Frequency Range: 1 – 200 Hz Top & Bottom: 30 minutes (+Z), 10 min (-Z), Right & Left: 10 minutes (X) Back & Forth 10 minutes (Y)	Non Operation
Dropping Test	1 Corner, 3 Edge, 6 Face, ISTA STANDARD	Non Operation

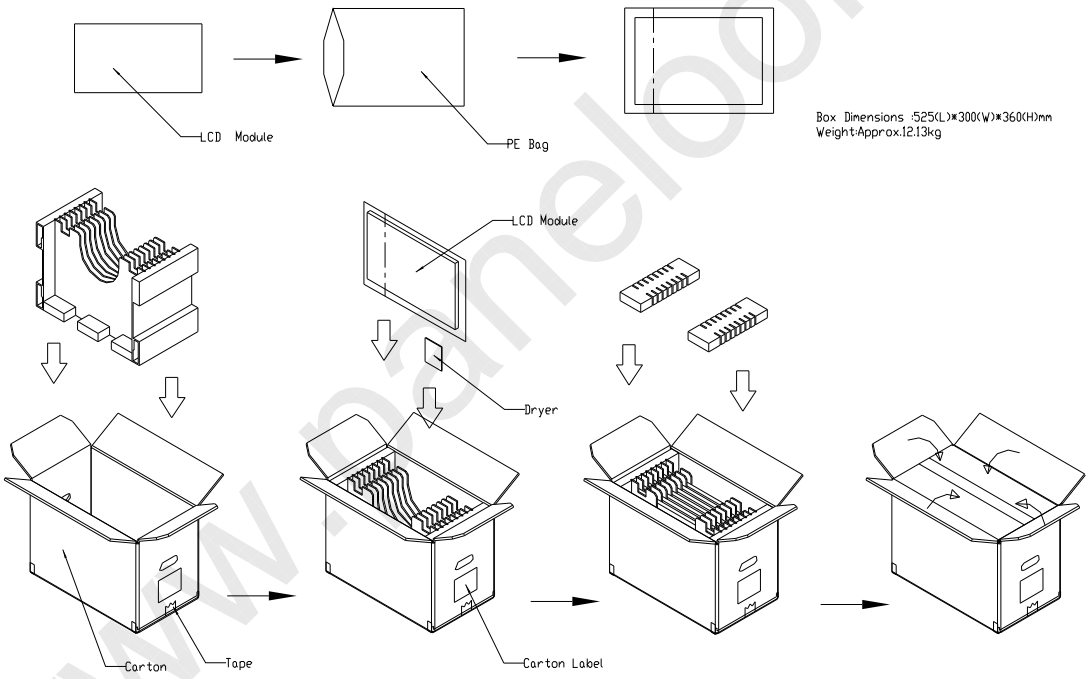
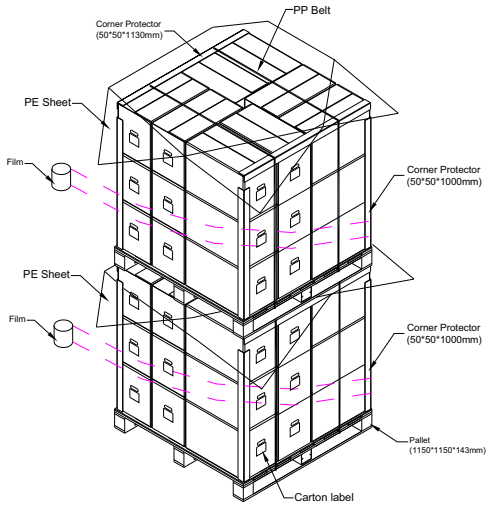


Figure. 8-1 Packing method

For ocean shipping

Sea / Land Transportation (40ft HQ Container)



Sea / Land Transportation (40ft Container)

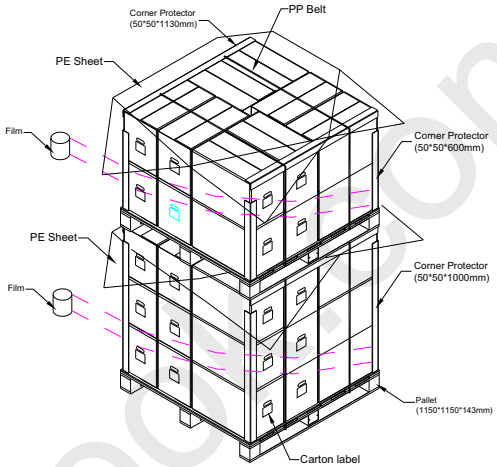


Figure. 8-2 Packing method

For air transport

Air Transportation

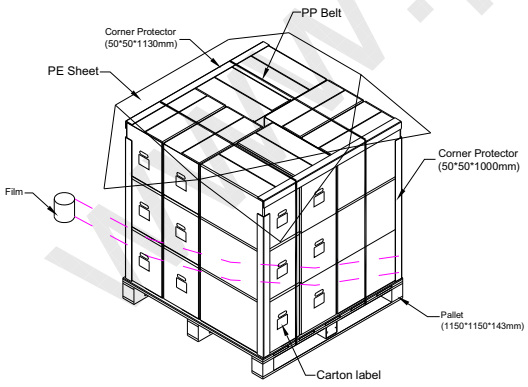


Figure. 8-3 Packing method

9. DEFINITION OF LABELS

9.1 CMO MODULE LABEL

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.

(a) Model Name: M190Z3-L06

(b) Revision: Rev. XX, for example: A0, A1… B1, B2… or C1, C2…etc.

(c) CMO barcode definition:

Serial ID: XX-XX-X-XX-YMD-L-NNNN

Code	Meaning	Description
XX	CMO internal use	-
XX	Revision	Cover all the change
X	CMO internal use	-
YMD	Year, month, day	Year: 2001=1, 2002=2, 2003=3, 2004=4… Month: 1~12=1, 2, 3, ~, 9, A, B, C Day: 1~31=1, 2, 3, ~, 9, A, B, C, ~, W, X, Y, exclude I, O, and U.
L	Product line #	Line 1=1, Line 2=2, Line 3=3, …
NNNN	Serial number	Manufacturing sequence of product

(d) Customer's barcode definition:

Serial ID: CM-19Z36-X-X-X-XX-L-XX-L-YMD-NNNN

Code	Meaning	Description
CM	Supplier code	CMO=CM
19Z36	Model number	M190Z3-L06=19Z36
X	Revision code	Non ZBD: 1,2,~,8,9 / ZBD: A~Z
X	Source driver IC code	Century=1, CLL=2, Demos=3, Epson=4, Fujitsu=5, Himax=6, Hitachi=7, Hynix=8, LDI=9, Matsushita=A, NEC=B, Novatec=C, OKI=D, Philips=E, Renasas=F, Samsung=G, Sanyo=H, Sharp=I, TI=J, Topro=K, Toshiba=L, Windbond=M
X	Gate driver IC code	
XX	Cell location	Tainan, Taiwan=TN
L	Cell line #	1,2,~,9,A,B,~,Y,Z
XX	Module location	Tainan, Taiwan=TN ; Ningbo China=NP
L	Module line #	1,2,~,9,A,B,~,Y,Z
YMD	Year, month, day	Year: 2001=1, 2002=2, 2003=3, 2004=4… Month: 1~12=1, 2, 3, ~, 9, A, B, C Day: 1~31= 1, 2, 3, ~, 9, A, B, C, ~, T, U, V
NNNN	Serial number	Manufacturing sequence of product

(e) UL Factory ID:

Region	Factory ID
TWCMO	GEMN
NBCMO	LEOO
NBCME	CANO
NHCMO	CAPG

10. PRECAUTIONS

10.1 ASSEMBLY AND HANDLING PRECAUTIONS

(1) Do not apply rough force such as bending or twisting to the module during assembly.

(2) To assemble or install module into user's system can be only in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.

(3) It's not permitted to have pressure or impulse on the module because the LCD panel and Backlight will be damaged.

(4) Always follow the correct power sequence when LCD module is connecting and operating. This can prevent damage to the CMOS LSI chips during latch-up.

(5) Do not pull the I/F connector in or out while the module is operating.

(6) Do not disassemble the module.

(7) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

(8) It is dangerous that moisture come into or contacted the LCD module, because moisture may damage LCD module when it is operating.

(9) High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.

(10) When ambient temperature is lower than 10ºC may reduce the display quality.

10.2 SAFETY PRECAUTIONS

(1) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap

(2) After the module's end of life, it is not harmful in case of normal operation and storage.

10.3 SAFETY STANDARDS

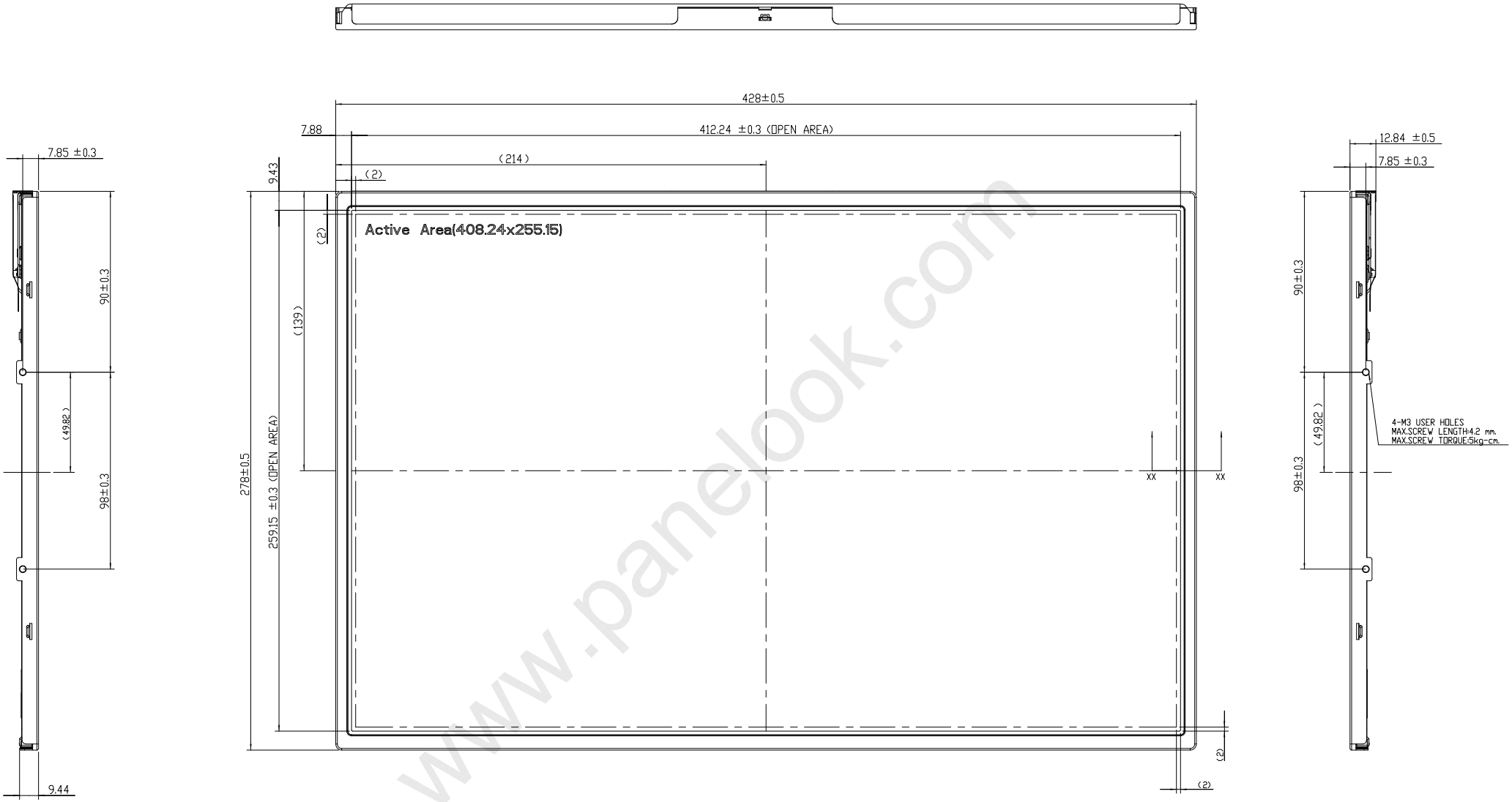
The LCD module should be certified with safety regulations as follows:

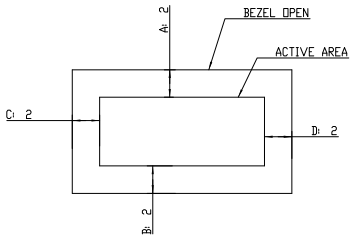
(1) UL60950-1 or updated standard.

(2) IEC60950-1 or updated standard.

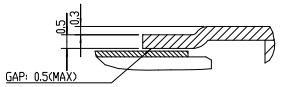
10.4 OTHER

When fixed patterns are displayed for a long time, remnant image is likely to occur.





NOTES:
1.UNSPECIFIED TOLERANCE: ±0.5mm.
2.I/F CONNECTOR SPEC.: STM MSAKT2407P30A OR STARCONN 093G30-B001A .
3.Tilt and portion disposition tolerance of display area
are as following
(1) Y-direction : IA-BI <= 1mm
(2) X-direction : IC-DI <= 1mm



SECTION XX-XX
SCALE 10:1

Mark	Description	Date	Changed_By	Approved_By	ECN No.	Remark

TITLE	ASSY_MODULE_M190Z3-L05_NOCVT			2D REV.	A
				3D REV.	1.5+
Approved	ALAN LEE	Drawing No.	M190G4103A		
Checked	AIDEN WANG	Part No.	TBD		
Drawer	AMONA PAN	Material	TBD	Sheet	1 / 2 A1
Designer	AMONA PAN	Date	06-Mar-2009	Scale	1:1 Unit:mm

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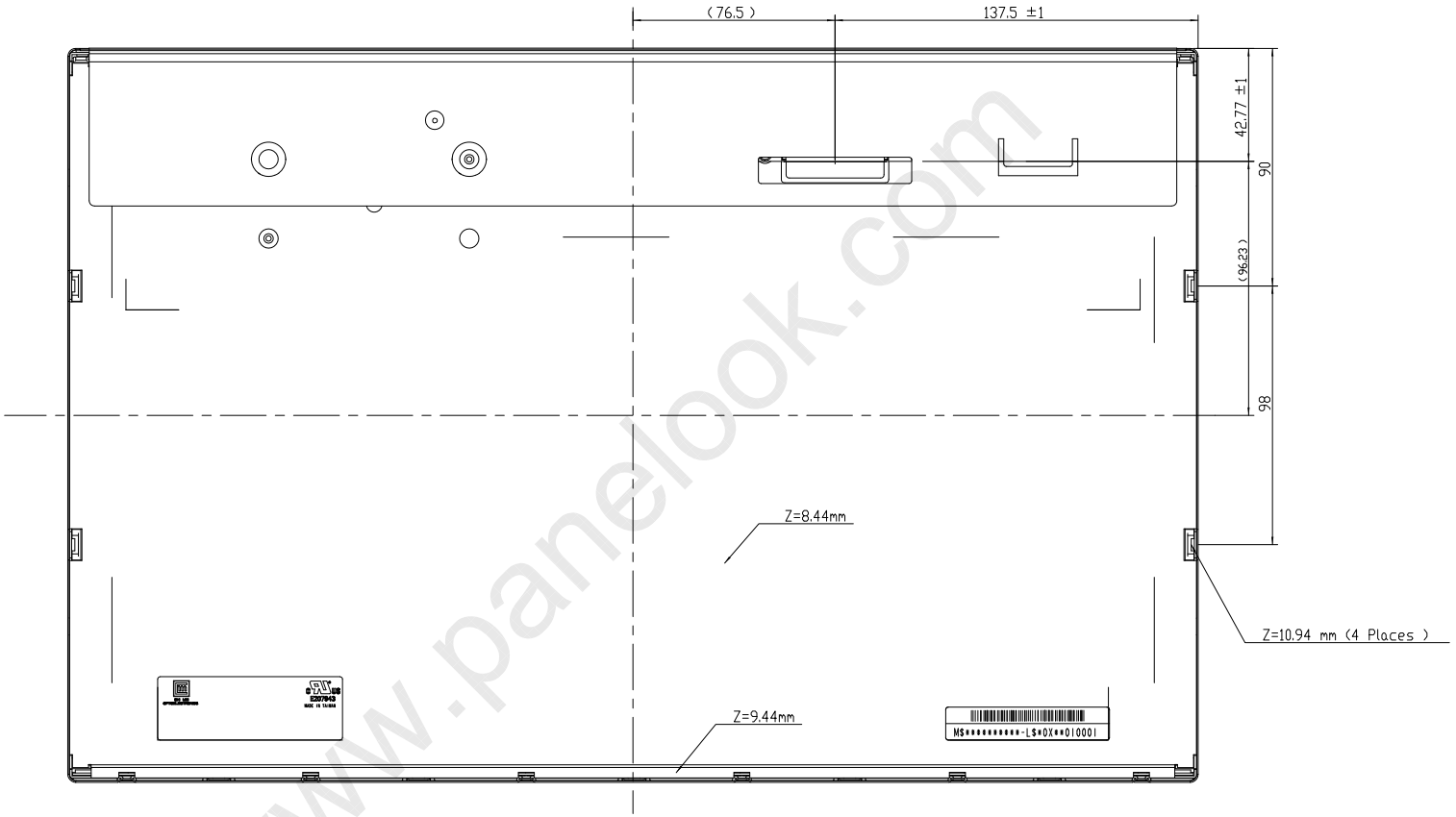

NOTES:
1.UNSPECIFIED TOLERANCE: ±0.5mm.
2.I/F CONNECTOR SPEC.: STM MSAKT2407P30A OR STARCONN 093G30-B001A .

Mark	Description	Date	Changed_By	Approved_By	ECN No.	Remark

TITLE	ASSY_MODULE_M190Z3-L05_NDCVT				2D REV.	A
					3D REV.	1.5+
Approved	ALAN LEE	Drawing No.	M190G4103A			
Checked	AIDEN WAN	Part No.	TBD			
Drawer	AMONA PAN	Material	TBD	Sheet	2 / 2	A1
Designer	AMONA PAN	Date	06-Mar-2009	Scale	1:1	Unit:mm

CHI MEI OPTOELECTRONICS CORP.